
LIVE TRAINING STANDARDS
(EMBEDDED STANDARDS UPDATE)
Brian Kemper, Pat Sincebaugh
30 November 2011
TIE-DOWN
Visit the Live Training
Community Portal at:
LT2Portal.org



PM TRADE

PROJECT MANAGER TRAINING DEVICES

PM TRADE - 2011 I/ITSEC Events

MONDAY, 28 NOVEMBER

PM TRADE Grey Beard Session
Invitation Only
- 1000 - 1200
- Army Meeting Room 202B (West)

TUESDAY, 29 NOVEMBER

TSIS Update - COL Flanagan
- 1330 - 1415
- Army Booth 143

LT2 Portal: Info/Demo Session - Dillon
- 1500 - 1600
- Army Service Room 202A (West)

Live Training Instrumentation for Unmanned Systems: Challenges and Lessons Learned - Sincebaugh (P)*
- 1600
- Room 304E

Leveraging SOA within Live Training: An Assessment - Kehr, Garcia (P)*
- 1630
- Room 304E

Proven Strategies for Securely Sustaining Simulators and Training Systems - Fleener (P)*
- 1700
- Room 304H

WEDNESDAY, 30 NOVEMBER

FASIT Technology Working Group: Low Bandwidth Framework - Todd
- 0800 - 1000
- Army Meeting Room 202B (West)

Common Through Sight Video - Crew Module Unit Recorder (CTSV-CMUR)
Invitation Only
- 0800 - 1000
- Government Meeting Room #2 (207C)

Live Training Standards (Embedded Standards Update) - Kemper, Sincebaugh
- 0900 - 1100
- Army Service Room 202A (West)

Live Training Campaign Plan Brief - COL Flanagan, COL Connors
- 1300 - 1500
- Room 304C

Embedded Training Workshop #3
Invitation Only
- 1430 - 1630
- Government Meeting Room #2 (207C)

Use of the IPod Touch for Live Training - Logan, Campos (P)*
- 1630
- Room 304A

THURSDAY, 1 DECEMBER

Next Generation of Distributed Training Utilizing SOA, Cloud Computing, and Virtualization - Lanman, Horvath (P)*
- 0830
- Room 304A

PM TRADE - Future Requirements Industry Planning Forum - Wolf
- 0900 - 1000
- Army Service Room 202A (West)

Employing the Second Generation Software Product-line for Live Training Transformation - Lanman, Kemper (P)*
- 1030
- Room 304H

Development of Embedded Live, Virtual, and Constructive Training - Harrison, Rhinesmith (P)*
- 1100
- Room 304H

(P)* Paper Sessions

Objectives



- **Quick update to community on PM TRADE Live Training Standards activities**
- **Focus on Embedded Training Standards**
  - Provide overview of Army Embedded Training
  - Embedded Training activities/path forward

I/ITSEC Standards Update

Benefits of Standardization



Commonality
- Reduces Developmental Cost
- Promote Reuse

Modularity
- Reduces lifecycle costs
- Improves Reliability, Availability and Maintainability (RAM)

Non-Propriety
- Greater vendor depth
- Maximize industry involvement in:
  - Tech Insertion
  - Developing product-line
  - Providing Training Capabilities

Interoperability
- Live/Virtual/Constructive - -Increases training opportunities and enhances each domain.
- Joint Service --Train as we fight.
- Test and Training -- Reduce costs.

Extensibility
- Enables modernization and embedded training

Accreditation
- Improve flexibility in addressing IA/system accreditation

Verification & Validation
- Test bed development and utilization

Live Training Standards Stakeholders







INDUSTRY PARTNERS





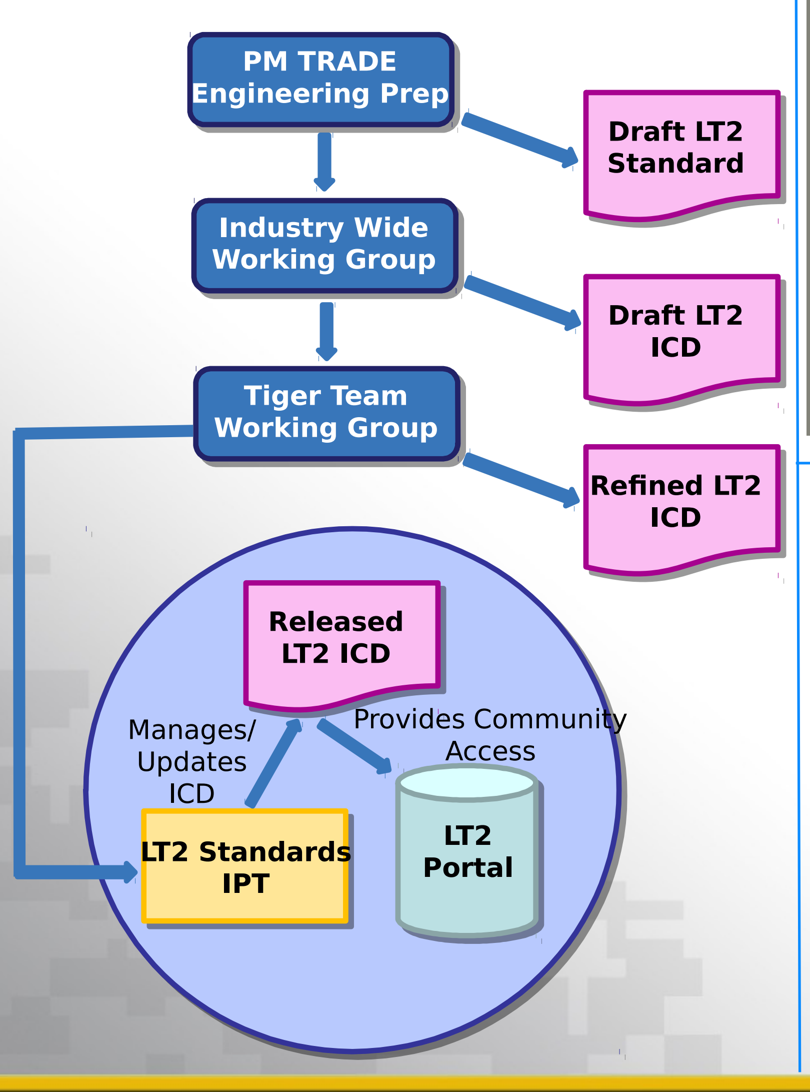


Government and industry work together to establish Live Training Standards to promote systematic reuse of software and interoperability solutions for the LT2 product line

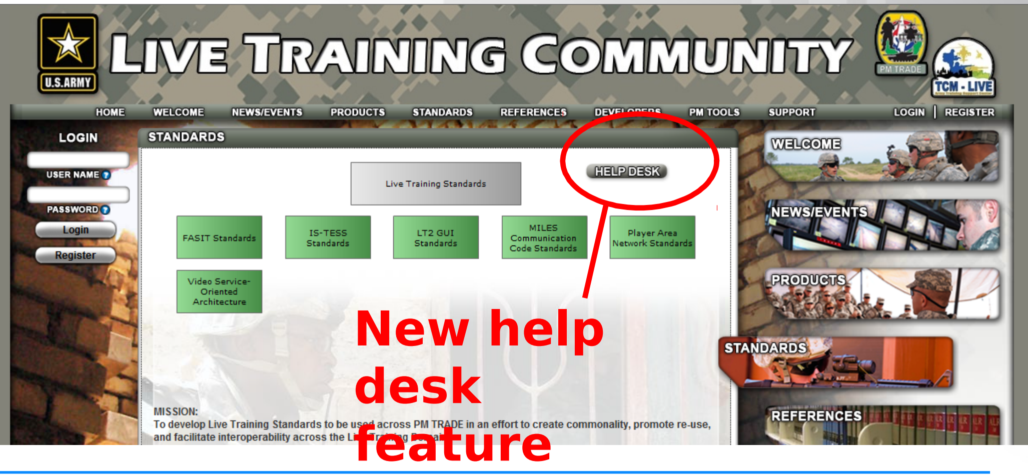
LT2 Processes and Test Bed(s)



LT2 Standards Life-Cycle



Standards and ICD's on Portal



Live Training Test Bed(s)

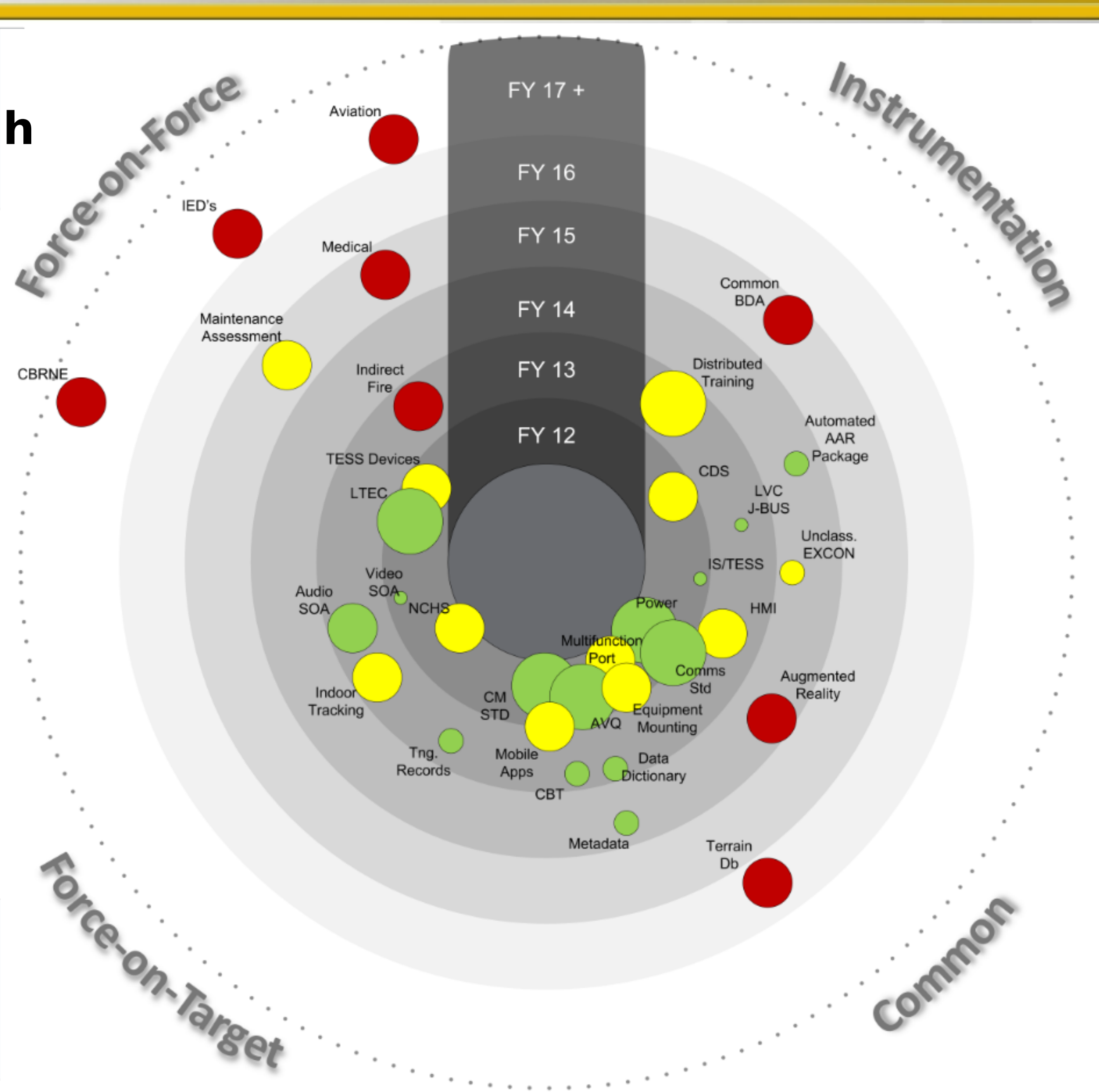
- **Capable of supporting Instrumentation/TESS Interface Standard requirements, PAN Standard requirements, and future live training standards requirements.**
- **Co-located Test Bed in the governments Integrated Development Environment (IDE)**
- **Will be used by Government to validate product compliance against the Standards and ICDs. Also can be used by Industry to test compliance of new products.**
- **Image availability on LT2 Portal**
- **Standing up new MILES test bed capability**

Domain Wide Standards Assessment

Structured approach to identify:

Impact:
- **Strategic**
- **Domain wide**
- **Enterprise**

Drivers:
- **Requirements**
- **LCC**
- **Technology**



Live Training Standards and Workshops

PEO STRI

Standardization of What?

- **Capabilities**
  - Instrumentation System (IS)
  - TESS
  - Targetry
- **Architecture**
  - Databases / Data Models
  - Services
  - Interfaces
- **SW Components**
  - C4I Interface
  - 2D Map
  - Tools
- **Processes**
  - LT2 ConOps
  - LT2 Portal
  - PL Acquisition
- **Requirements**
  - Specifications
  - Performance Parameters
- **Design**
  - CBT
  - GUI
- **Next Generation Distributed Training**

FY11

- IS-TESS Standard
- PAN Standard
- Video SOA Standai
- Networks/Radio Standard
- RTCA Standard(s)
- FASIT
  - Presentation Device 2
  - Range Effects Devices
    - Sound Effects
    - BES ICD
- Audio Visual Cueing
- LVC
  - Interface (JBUS)
  - Terrain DB format
- Embedded Training Worksho

FY12 + Beyond

- Multi-Function Vehicle R t
- Dual Use Laser Standards
- Computer-Based Training
- Training Records
- CTIA/SOA
- Power Standar
- Mobile App Framew k
- A-TESS Component Standar s
- Electronic Warfare
- Battlefield/Weapons effects
- Switchable Vision Blocks
- OneSAF Virtual Extensions
- Non Contact Hit Sens r
- Common Armor Target Silhouette
- Embedded Training Worksho
- Training Standards Workshop7
- LTEC

Continuing (% done in green)
Completed
FY12 Priorities





Embedded Training:

What is it and why is the Army pursuing?

Embedded Training Definitions



Embedded Training: A functional capability hosted in hardware and/or software, integrated into the overall equipment configuration. ET supports training, assessment, and control of exercises on the operational equipment with auxiliary equipment and data sources as necessary. (AR 70-1)

- ***Appended:*** On-board training hardware/system software entirely contained on a Line Replaceable Unit (LRU) that is connected to the vehicle through a training port. *The LRU is not resident on or in the vehicle during combat operations.* In some instances, the vehicle systems are modified to support a training mode of operation.
- ***Partially Embedded:*** Same as appended with the exception that a portion of the On-board training system software (e.g. vehicle behavior models) or a MILES detector/emitter, is resident on one or more of the current vehicle LRUs. This may require an upgrade to one or more existing vehicle LRUs.
- ***Fully Embedded:*** All On-board training hardware/system software is resident on current LRUs or one or more new LRUs *that remain in the vehicle during combat operations.* (Reuse integral platform H/W and S/W to provide the training capability.)

Embedded Training – Why do it?



Why do it?

- Required by Army Regulations (AR 70-1, AR 350-1, AR 350-38, TRADOC PAM 525-8-3, TRADOC Reg 350-70)
- Provides Training to Warfighter Anytime, Anywhere
  - Supports "Deployed" training
  - Supports "Train as you fight" paradigm
- Army's preferred solution
- Combat vehicles have ET requirements

What does ET support?

- Enables LVC Embedded Training in Combat Vehicles and using Battle Command systems.
- Reduces TADSS and associated O&S costs
  - Although do need to analyze cost/benefits associated with embedding
- Reduces need for "Brick and Mortar" facilities

Embedded Training - Benefits



- **Provides ability to 'train as you fight' using operational equipment**
  - Balance cost of using real equipment – can be supplemented with virtual
- **Provides ability to train while deployed**
  - Feedback from theater – this is needed capability
- **Embedded TESS eliminates or reduces time to 'MILES up'**
  - Time savings could result in added training rotation
  - Need to conduct cost/benefit analysis to determine best approach
    - Tradeoff – each vehicle will have TESS equipment vs. only those at range
    - Dual use of operational equipment will increase cost benefits

ET is providing a new capability that takes Training to the Soldier anywhere, anytime

Army Regulations



AR 70-1 Army Acquisition Policy: “The PM (developing/acquiring/fielding systems for the Future Force) will use embedded training and diagnostic/prognostic maintenance techniques to the maximum extent possible to enhance user capability and reduce life-cycle costs.”

- AR 350-1 Army Training and Leader Development: “Embedded training capabilities will be evaluated and considered as a preferred means to incorporate training subsystems into the development and follow-on product improvement programs for Army materiel systems.”
- AR 350-38 TADSS Policies and Management: “The system PEO/PM will— … *b. Consider the application of embedded training in all system development.”*

Army Training Concept 2012-2020
TRADOC PAM 525-8-3

PEO STRI

- Embedded Training is part of the Army's Integrated Training Environment (ITE)
- ET supports deployed training
- ET complements/enables Mission Rehearsal capabilities
- ET supports "Train as the Soldier will fight"
- Army wants ET implemented into the Army's ITE by 2016-2020
- ITE Phase three shall include an embedded training capability and a deployed training capability

Army Training Concept 2012-2020
TRADOC PAM 525-8-3

PEO STRI

“ Future Army forces require the capability to conduct deployed training that includes persistent access to automated training management systems, digital terrain databases replicating the OE, deployable TADSS, embedded training, developed theater training infrastructure, and sustainment training in language and culture to ensure success while conducting full-spectrum operations. “

- “Deployed Training. … a. Imperatives that span all formations are addressed below. (1) Embedded training capabilities are required capabilities.”

- “Embedded training is required to provide the capability for commanders and leaders to train in the three interconnected dimensions of full-spectrum operations and support high fidelity mission rehearsals.”

Combat Vehicle Requirements

Embedded Live Training Requirements



Examples from combat vehicle ORD's and CDD's

Full Embedded Training (ET) desired to meet deployability operator and maintainer training requirements will be addressed concurrently with materiel development. The ET concept must include individual and crew, squad, section, platoon and Company/Troop level and unit leader training tasks that can be performed in a deployed theater, in garrison, and in a field environment.

- ET supports mission rehearsals, saves training exercise data for AARs, provides the capability to access doctrinal references, and supports embedded tactical engagement simulation (TESS).
- Live force-on-force (FOF) and force-on-target (FOT) training will be supported by an embedded-tactical eng

Time to address ET requirements is during vehicle modernization programs and during initial GCV phase

PM TRADE/Army ET Activities



- Embedded Training Working Group
- Combat Vehicle ET Fact Finding
- Defining ET Vision
- Ongoing ET Efforts
- ET Standards/ICD Development

Army ET Working Group



- Established Spring 2011, led by PM TRADE
- Membership currently government only
- Working Group Objectives
  - Coordinate Army ET activities
    - Identify commonality/leveraging opportunities
  - Prioritize ET activities
  - Develop path forward for ET
- ET Workshop 1, 22-23 Apr 11, Orlando, FL
  - Initial information exchange
  - Leveraging opportunities/draft roadmap
- ET Workshop 2, 15 Sep 11, Ft Benning, GA
  - Summary of PEO STRI vehicle PM visits
  - Strategic roadmap & priorities
- ET Workshop 3, 30 Nov 11, I/ITSEC Conference
  - VICTORY, TCM-L, ATSC briefs
  - Path ahead & priorities

Current Members

PEO STRI
PM HBCT – Abrams
PM HBCT – Bradley
PM Stryker
PM GCV
PM Soldier Warrior
MCOE
TCM HBCT – Abrams
TCM HBCT – Bradley
TCM Stryker
TCM Live
TCM Virtual
TPIO OneSAF
TARDEC
JPO MRAP
PM CROWS
STTC

Fact Finding Out-brief



- PEO STRI visited vehicle PM’s (Abrams, Bradley, Stryker, GCV) to gather info regarding ET requirements, goals, status, and needs
- All of the vehicles have ET requirements
- Attended Vehicular Integration for C4ISR/EW Interoperability (VICTORY) standards workshop
- Visited OASIS - Common Embedded Training System (CETS)



Many common threads regarding ET requirements and implementation plans



Bradley Training Port

DRAFT ET Strategic Roadmap



Program	FY12 – FY22
Abrams	Embedded Hardware (RSU), VHMS, Training Port; eMR, Maneuver, TESS, Full Gunnery, Maintenance, Collective
Bradley	CETS; ECP1, No ET; ECP2 ET Prep, SWAP; Modernization, Net Centric, ET
Paladin	New fire control system with ET
Stryker	ET – Virtual, CBT, Training Port; Modernization depending on budget and needs, may include some ET elements
Network	JTRS HMS (RR, Manpack); SRW/WNW; WIN-T; Commercial technologies
Dismounted Soldier	Squad: Decisive Force, Nett Warrior , JTRS HMS , JBC-P H/H, Combat ID
GCV	Tech Development; EMD; Production
Mission Command	FBCB2/BFT/CPOF/TIGR; JCR; JBC-P
A-TESS/LTEC	I-MILES/OneTESS; Embedded, Med, Aviation; Air Defense, CBRNE, EW, APS, Non-lethal
T-IS	CTC network/instrumentation; Homestation network/instrumentation; Deployed
TADSS Componen	
PEO STRI	

- Embedded training is a common requirement across all programs
- It is PEO-STRI's goal to provide coordinated efforts to identify and develop ET specifications, standards, interfaces and common components
- Time to address ET requirements is during vehicle modernization programs and at GCV initial phase

- Vehicle Mul
  Port Specifi
  (funded)
- LTEC efforts (funded)
- A/V Cue Standard (funded)
- Laser/Sensor Dual-Use

specification
s as needed

Fact Finding Out-brief
Common Threads



Size/Weight/Power/Cost
- All platforms need to reduce impact of embedded training on SWPC
- Must co-exist and work within existing on-board systems
- External ET-only devices are eventually removed

Alignment of Embedded Training with Tactical Requirements
- Common functions/complimentary capabilities (i.e., MR)
- ET 'must be' aligned with tactical requirements to minimize ET's cost
- Alignment assures ET is not a separate 'trade space'

Dual Use
- All platforms request ability to use on-board tactical systems for ET
- MILES emitters and receivers might map to tactical laser systems
- Potential for reducing CTC preparation time, cost

Fact Finding Out-brief
Common Threads (cont)



- **Standards, not Hardware**
  - Standards, specifications, not an explicit solution that might not fit
  - Standards and specifications must allow for embedded solutions
- **Standardized Training Port**
  - Incorporate existing implementations, publish for future use
- **Specifications**
  - Detailed performance and interface specifications
- **Information Assurance**
  - Adds excessive complexity and cost
  - At times at cross-purposes with networked collective embedded training
- **Scalability**
  - Need to support individual, crew, and networked platform collective
  - Only PM Stryker has demonstrated networked collective at this

Fact Finding Out-brief
Common Threads (cont)



Standardized Training Mode

- ❑ Standardize process, procedures and technology required to enter and exit training mode

Mission Command

- ❑ Must integrate ET with Mission Command

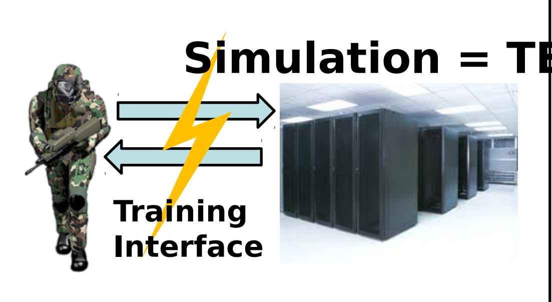
➢ **Training vs. Mission Rehearsal**

- ❑ Re-use ET technology
- ❑ Needs ability to rapidly create high-fidelity digital terrain

ET Vision Paper



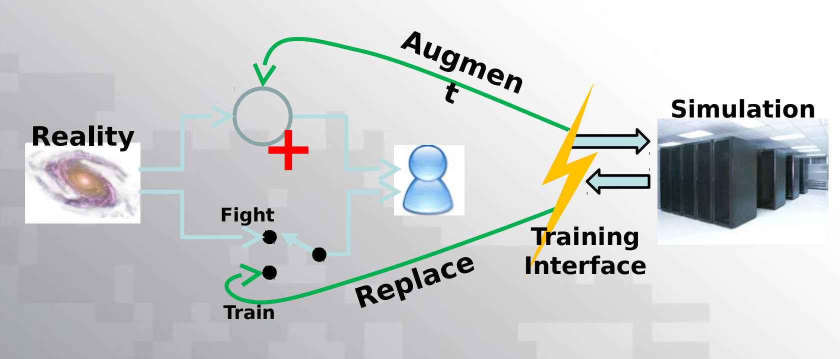
- What is ET?
- Why is ET needed?
- Supported by Army Doctrine
- Conceptual Framework
- Application Areas
- Technical Challenges
- Programmatic Challenges
- An Incremental Plan
- Expectations

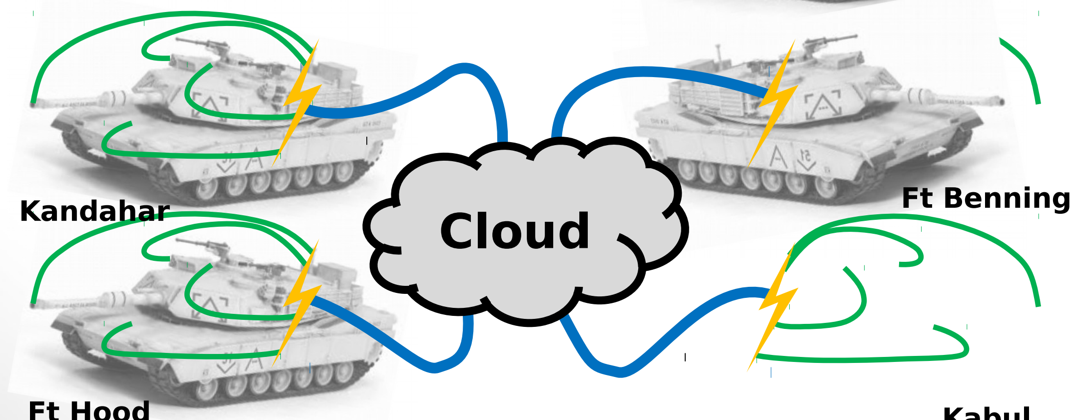


Vision
For
Embedded Training

9 September 2011

Version 26





Live Training Potential Path to Embedded Training



* = Devices mounted inside vehicle

*Fire Control Interface

Small Arms Transmitter

Hull-to-Turret Transmitter

* Radio Interface Assembly

* Vehicle Display Assembly (2)

Vehicle Control Unit/Kill Indicator

Main Gun Laser Transmitter

Detector Belts (4)

M1

Appended Training Systems

CRAWL

FlashWESS (Bradley Only)

Vehicle Control Unit

Main Gun Laser Transmitter

Vehicle Display Assembly

Vehicle Weapons Interface

Radio Interface Assembly

Embedded MILES Detectors and Main Gun/Small Arms Laser Transmitters

WALK

Phased Approach to Embedding Training Devices into the Platforms

UAV/UVC Feed

UAV/CS

DRTS

NTC

Urban Ops Instrumentation

HITS

CTC Instrumentation

Instrumented Ranges

JRTC

Combat Training Centers (CTCs)

HITS, DRTS & CTC Interoperability

DRTS

Urban Ops Instrumentation

Instrumented Ranges

HITS

Homestation / Institution

RUN

Embedded Radio, Vehicle Interface, Display, and Main Gun Laser

Examples of Ongoing ET Efforts



- SUGV
- Live Training Engagement Component (LTEC)
- CETS
- Embedded Battlefield Effects Simulation System (EBESS)



Small Unmanned Ground Vehicle (SUGV)

Small Unmanned Ground Vehicle (SUGV)



- Developed under FCS/BCTM program
  - Reqt's: embedded MILES and CTC-IS interoperability
  - Interop with NTC demonstrated – required modification to SAIC player unit firmware
  - Required modification of live training ICD's
    - 290063 – Data interface between CIS CTC-OIS and TCN for NTC-IS
    - 290064 – Data interface between RCS DCIU & TCN for NTC-IS
    - 290065 – Interfaces between RCS RDMS DCIU and TESS
    - 290066 – Interfaces between RCS RDMS tables attachment for NTC-IS
  - Modifications supported
    - Multiple player support
    - 3rd party position/location/time reporting
    - Persistent player ID



ETESS
- CVKI
- Detectors



ICD's recently combined into IS-TESS Standard – future update (to include modifications above) will enable small UxV's to participate in instrumented live training



Live Training Engagement Component (LTEC) Overview

Live Training

Potential Path to Embedded Training





Appended Training Systems

- Current live training systems interface multiple appended hardware components
- No common or core software architecture to interface components together







CRAWL

Phased Approach to Embedding



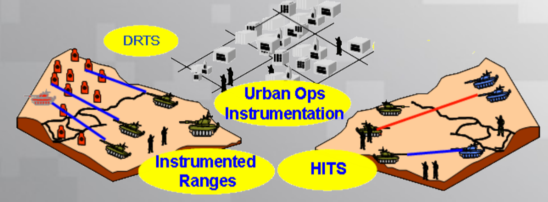
Embedded MILES Detectors and Small Arms Laser Transmitters

WALK

LTEC is an enabler for embedded live training

Combat Training Centers (CTCs)

HITS, DRTS & CTC Interoperability



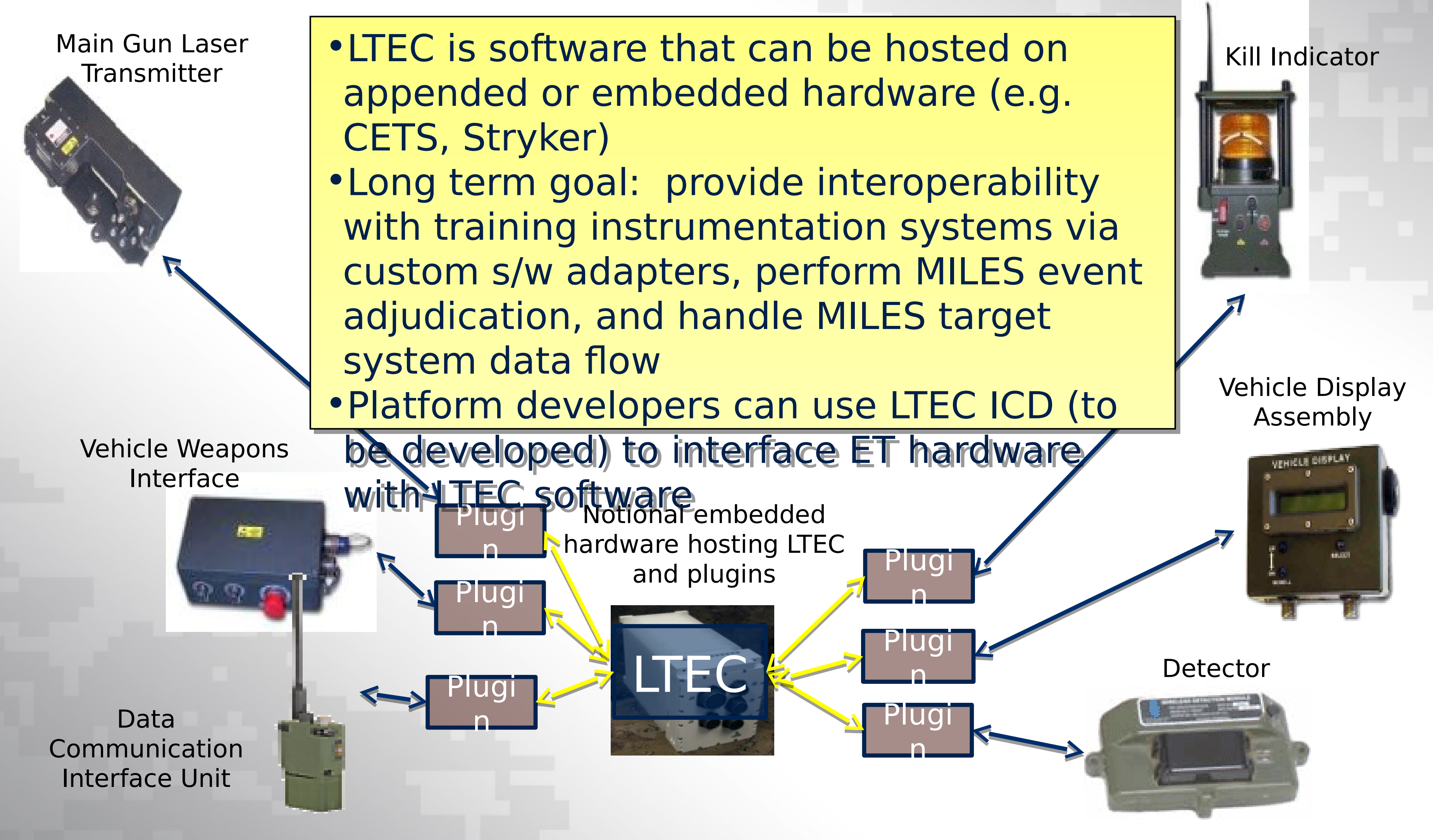


RUN

Embedded Radio, Vehicle Interface, Display, and Main Gun Laser

Homestation / Institution

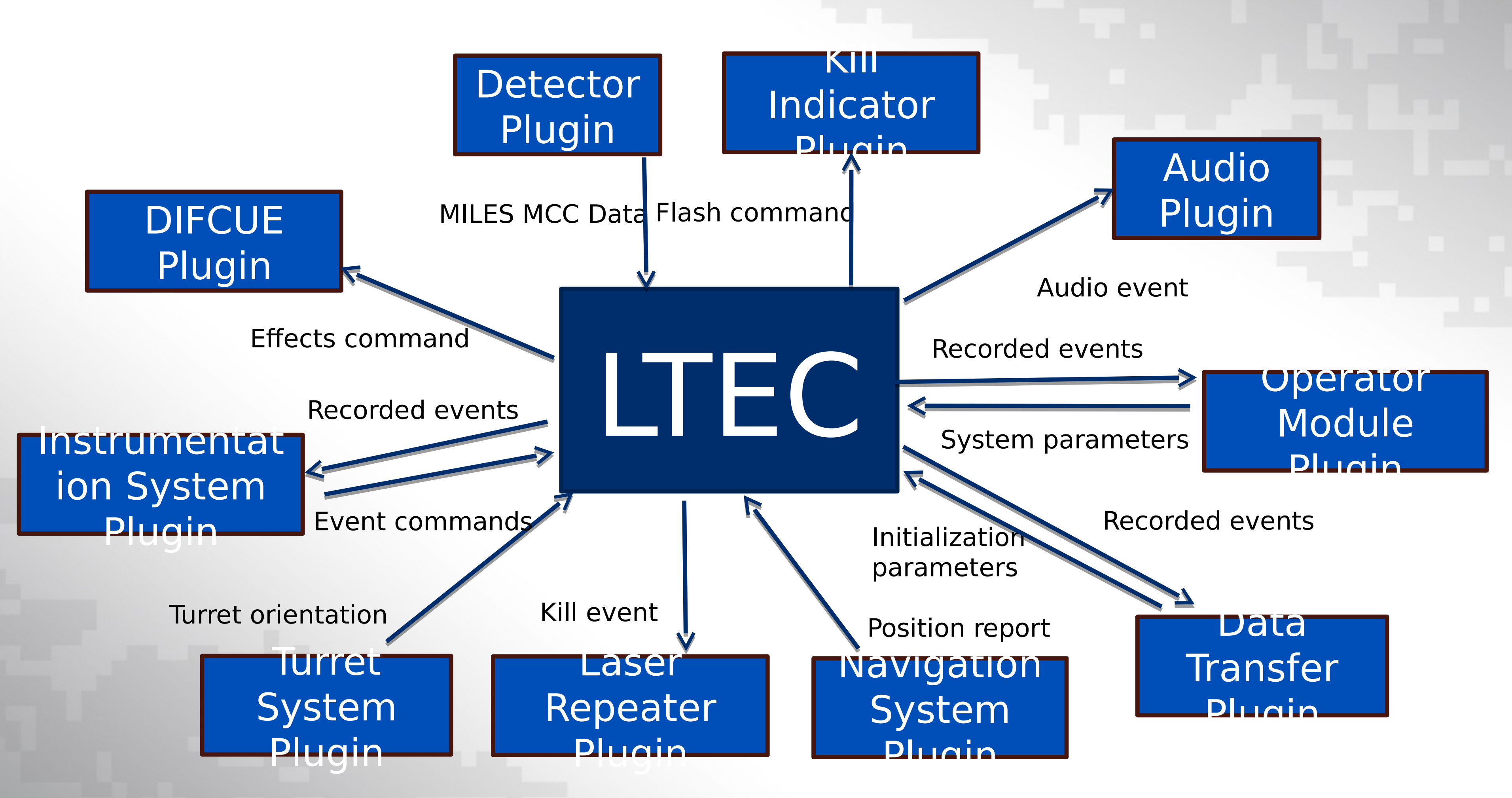
Live Training Engagement Component
Application Framework Vision



STRI

te: Interfaces represented by yellow arrows are documented in the LTEC ICD

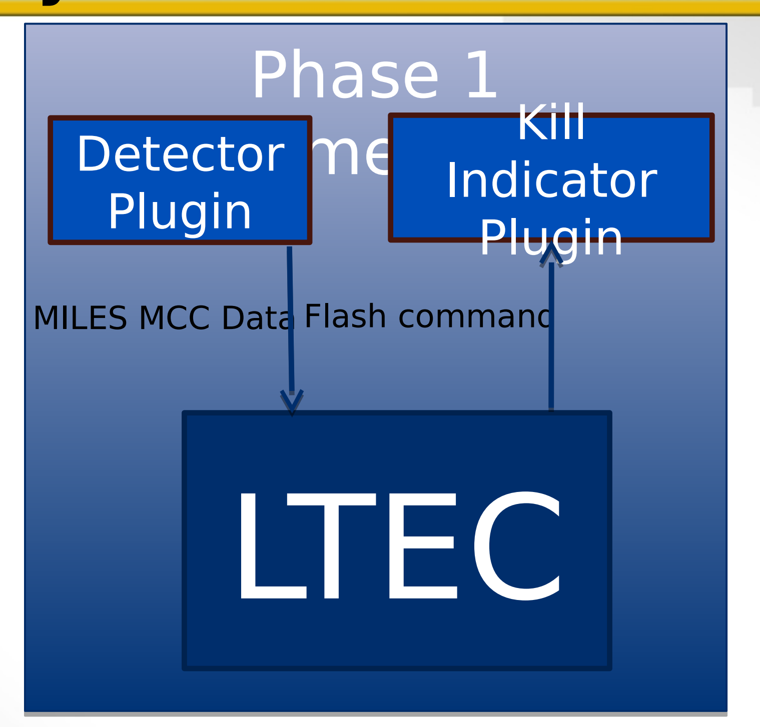
Live Training Engagement Component
MILES Target System Data Flow



Note: Plugins with hardware receive BIT commands and send BIT status results
Plugins with a battery send battery status

Live Training Engagement Component
MILES Target System Data Flow

STRI



DIFCUE Plugin

Audio Plugin

Instrumentation System Plugin

Operator Module Plugin

Turret System Plugin

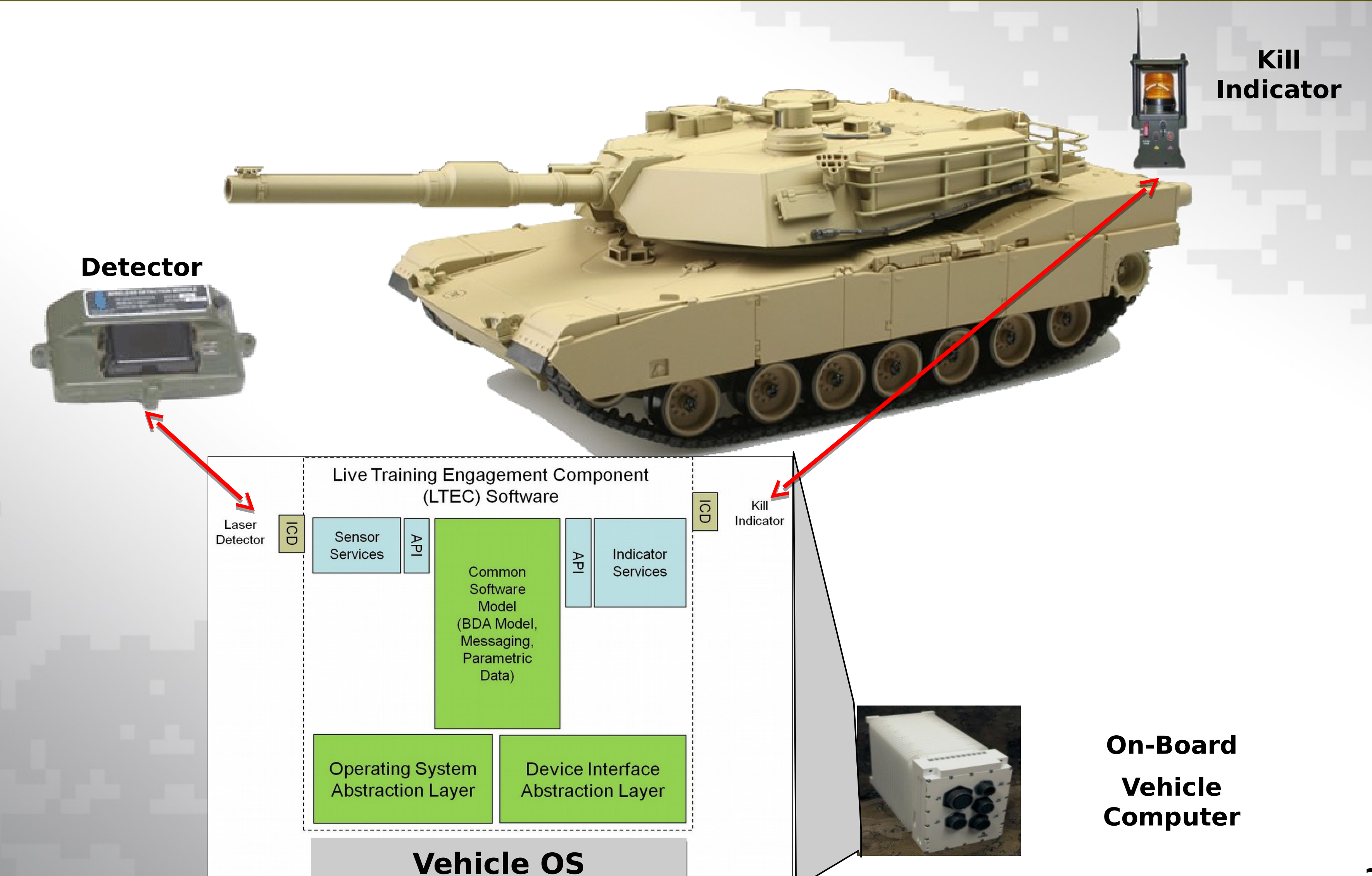
Laser Repeater Plugin

Navigation System Plugin

Data Transfer Plugin

Note: Plugins with hardware receive BIT commands and send BIT status results
Plugins with a battery send battery status

Live Training Engagement Component
Phase I Effort





Common Embedded Training System (CETS)

Common Embedded Training System (CETS)



Appended or embedded system to enable embedded training on Bradley and Abrams

Provides commonality

- Training exercises
- Databases
- Moving models
- Image generator
- HBCT training manual
- Hardware

➢ **Platform specific functionality**

- Vehicle behavior
- Mounting and cabling
- Training port
- ICD

➢ **Potential platform for LTEC integration**



✓ **BAE: Bradley Ownship Modeling**

ICD: Doc # 13024623 Rev



CETS

ICD: Doc # CEEP-SA15132
Vol . 21 v 7.0



o **GDLS: Abrams Ownship Modeling**

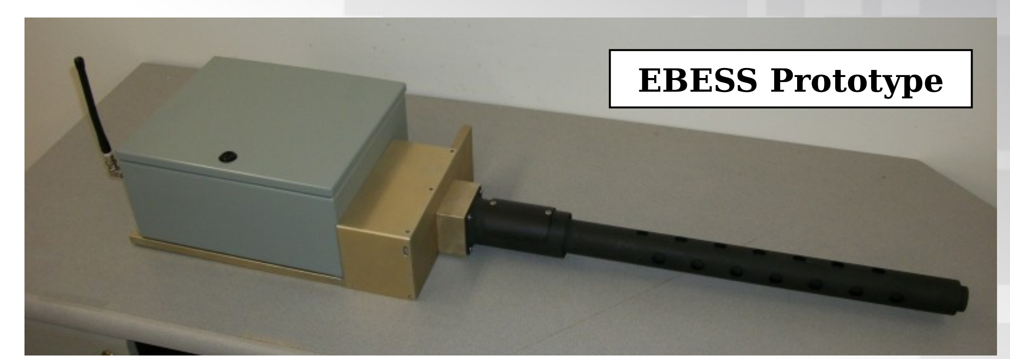


Embedded Battlefield Effects Simulation System (EBESS)

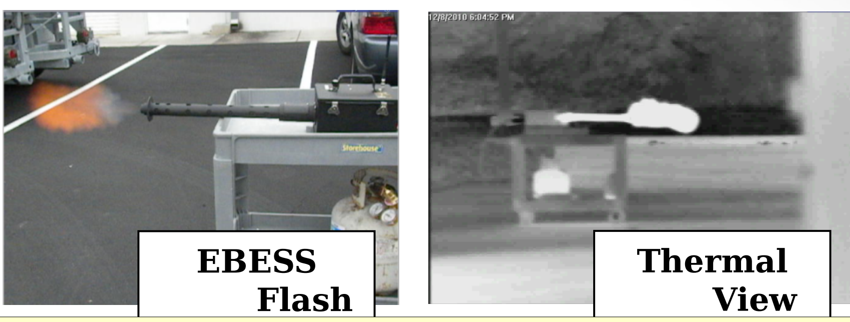
Embedded Battlefield Effects Simulation System (EBESS)



Objective: Develop a *low cost-per-shot, low power, weight and cost* prototype to simulate the visual, IR and aural effects of combat vehicle weapons.



- Phase II SBIR completed 30 Sep 2011
  - D&S Consultants, Inc. (DSCI)
  - Prototype at DSCI I/ITSEC booth
- Prototype simulates effects of Bradley M2A3 Main Gun and Coaxial Gun
  - Initially focused on FCS MGV's
  - Interfaces with 1553 bus
  - Adaptable to other vehicles/weapons
- Design doesn't use explosive cartridges or one-time consumables
  - >5,000 shots before refueling



- Sound generation – 130 dB measured at 20m
- Variable shot rates to simulate different gun types
- Flash generation subsystem - simulate gun flash
  - Visible flash and IR signature
- Smoke generation subsystem – simulate visible

EBESS development highlighted need for audio/visual cueing standards



Embedded Training Standards and Specifications

ET Activities and Path Ahead



FY12	1st QTR	2nd QTR	3rd QTR	4th QTR	FY13 +

AV Cue Std

Standard Audio Data Repository

Vehicle Multi Function Port Standard

IPT

Live Training Engagement Component (LTEC)

Integration/Demonstration Path Decision

COE Real Time Safety Critical Embedded CE/VICTORY Standards Working Groups

Laser Dual-Use CBA

ATESS: Laser/Sensor Standard

ET Cost Benefit Analysis

Pursue/No Pursue Decision

ET Vision Paper

Last Call for Comments (government)

Other Specifications as Needed

Will need industry inputs to support standards development

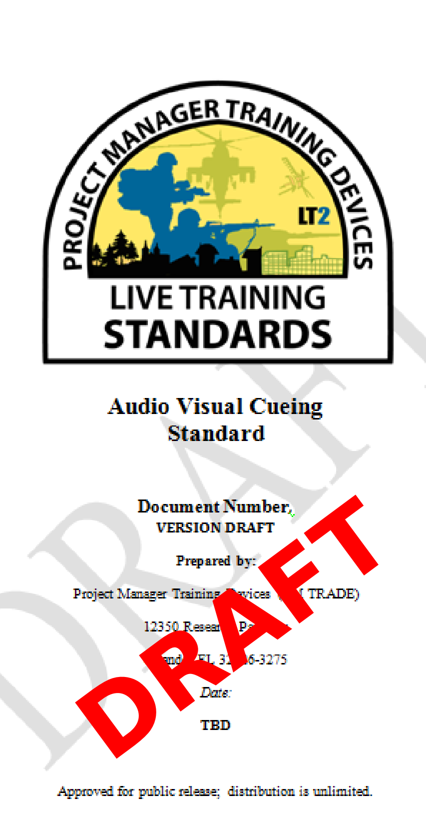
Audio Visual Cueing Standard



Objective: Provide audio and visual cueing standards for combat vehicles, aviation, dismounts, and unmanned ground and air vehicles (small and large).

Status:

- Draft under review by PM TRADE Standards IPT
- Current version consolidates audio and visual cues defined in current force MILES specifications
- Includes specifications developed by BCTM for small UxV's
- Final draft may include battlefield effects
- Future revisions may include medical
- Related objective: provide a standard



Expect to seek industry input within 45 days

Vehicle Multifunction Port Standard

Line Replaceable Unit

MILES
Video
Multimedia
High Bandwidth Data



Vehicles

Abrams
Bradley
Stryker
GCV
...

Objective:

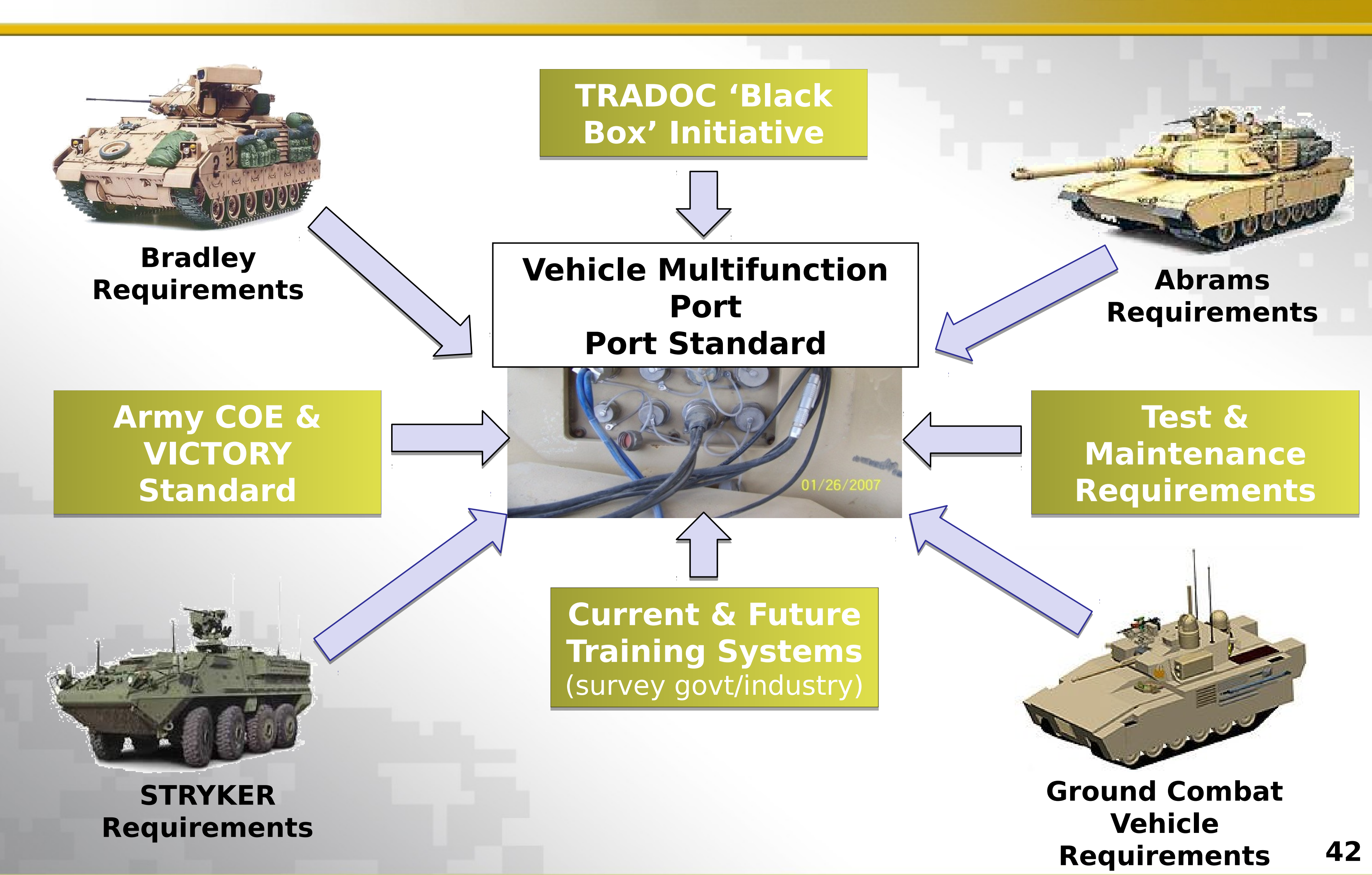
- Standardize electrical, mechanical, and functional properties of external vehicle ports to support training, testing, and maintenance applications for combat vehicles.
- Standard will take into account current and future needs
-

Status:

- Vehicle Multifunction (VMF) Port standard identified as a near term priority by Army ET Working Group
- Plan to establish VMF IPT within 30 days
- Bradley, Abrams, and Stryker already developing Training Ports
- Others looking into systems to support testing & maintenance

Need input from industry to help define what standard should address

Vehicle Multifunction Port Standard



Dual Use Laser Standard



Objective: Develop standards and/or ICD's to enable platform developers to develop systems with dual use lasers for tactical and training applications (e.g. laser range finders/MILES lasers, active protection systems/MILES detectors)

Status:

- Currently an unfunded effort
- Discussion topic for Army ET Working Group
- PM TRADE conducting Dual Use Laser Cost Benefit Analysis - due FY12 2Q
- PM TRADE A-TESS program will address many of MILES requirements beginning in FY12 4Q

Future Embedded MILES / Instrumentation System

Weapons Effects Signature Simulator and Kill Indicator Appended

Integrated Player Unit/IS radio

Embedded MILES-compatible Laser Detector

Embedded MILES-compatible Laser with Tactical Laser Range Finder

On board tactical computer executing MILES functionality

Summary



- Numerous regulations and doctrines dictate embedded training as the Army's preferred solution
- Combat vehicles all have embedded training requirements
- Army ET Working Group established and meeting quarterly
  - Defining Army ET vision, path ahead, coordinating efforts, developing strategic roadmap
  - Standards and specifications are a top priority
  - Relationships/roles/responsibilities between Platform community and M&S community evolving
- Number of ET initiatives have been demonstrated and/or are under development

Industry input to standards development imperative for success

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